MATTE FINISHING OF AUTOMOBILE OUTER PANEL

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Applicant(s):: KANSAI PAINT CO LTD
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Equivalents:

Abstract

PURPOSE:To form a coating film which does not lose its matte effect even when polished and is improved in mar resistance, staining resistance, etc., on an automobile outer panel by coating the panel with a crosslinkable and curable colored coating material and then with a specified crosslinkable and curable clear coating material.
CONSTITUTION:A crosslinkable and curable clear coating material (A) which can be crosslinked and cured by a three-dimensional crosslinking reaction at room temperature or by heating is mixed with 30-120 pts.wt., desirably 40-110 pts.wt., per 100 pts.wt. resin solids of component A, glass powder desirably having a composition of SiO2, Al2O3, Na2O, K2O, MgO and CaO and having a particle diameter of 5-50mu, desirably 8-25mu to obtain a crosslinkable and curable clear coating material (B). An automobile outer panel is coated with a crosslinkable and curable colored coating material and then with component B.

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(54) Title of the Invention: METHOD FOR MATTE FINISH COATING OF AUTOMOBILE BODIES

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Specifications

1. Title of Invention

METHOD FOR MATTE FINISH COATING OF AUTOMOBILE BODIES

2. Patent Claims

A method for matte finish coating of automobile bodies by coating a crosslinkable color paint and then coating a crosslinkable clear coating material on the painted surface, wherein a

coating material containing 30-120 wt. parts of a glass powder with a particle size of 5-50 μ per 100 wt. parts of resin solids is used as said clear coating material.

3. Detailed Description of the Invention

<Field of Industrial Application>

The present invention relates to a method for matte finish coating of automobile bodies, more specifically, to a method for finish coating a paint film having excellent resistance to scratches, contamination, and weather and maintaining a matte effect after polishing.

<Prior Art Technology and Problems Relating Thereto>

Automobiles (including motor cycles, buses, trucks, and the like) have been usually finished with glossy paint films having excellent gloss. However, in recent years they have been sometimes finished with matte paint films to create new designs.

In order to obtain a matte finish coating, a silica powder has been often added to a finish coating material. However, since the silica particles were raised to the surface layer of the paint film, they were separated and removed when the film surface was polished. As a result, only the corresponding zones were glossy, which was undesirable. Another drawback was that the resistance to scratches, contamination, and weather was decreased.

<Means to Resolve the Problems>

It is an object of the present invention to overcome all of the above-described drawbacks. This object can be attained by using a clear coating material containing a glass powder with a specific particle size. The present invention is based on this idea.

Thus, the present invention provides a method for matte finish coating of automobile bodies by coating a crosslinkable color paint and then coating a crosslinkable clear coating material on the painted surface, wherein a coating material containing 30-120 wt. parts of a glass powder with a particle size of 5-50 μ per 100 wt. parts of resin solids is used as the clear coating material.

The term "matte" employed in this specification refers to a coated surface which has a 60-degree mirror surface reflectivity (defined as a gloss value of a coated surface by JIS K5400, Section 6.7) of no more than 50%, especially, no more than 30%. In accordance with the prevent invention, the coated surface of the clear coating material has such a gloss value and forms a matte coating film.

The clear coating material used in accordance with the present invention is a coating material for forming a matte transparent film, this coating material containing a resin composition which is three-dimensionally crosslinkable at room temperature or by heating and the above-described glass powder as the necessary components.

As a rule, the resin composition contains a base resin and a crosslinking agent as the main components. Examples of suitable base resins include acrylic resins, polyester resins, and alkyd resins having crosslinking functional groups. Examples of suitable crosslinking agents include methylol- and/or alkyl ether-modified melamine resins or urea resins; polyisocyanate compounds

(including block compounds) may also be used. Furthermore, self-curable resins which use no crosslinking agents may also be used as the resin composition.

Furthermore, in a coating material composition prepared by using as a base resin a vinyl copolymer containing a specific polysiloxane-type macromonomer comprising no less than two free functional groups, such as hydroxyl groups and alkoxy groups, and an oxirane group-containing vinyl monomer as monomer components, or a mixture of a polymer containing the specific polysiloxane-type macromonomer as the necessary monomer component and a polymer containing the oxirane group-containing vinyl monomers as the necessary monomer component, and adding at least one compound selected from a group including Lewis acids, protonic acids, metal alkoxides, organometallic compounds, and compounds having a Si-O-Al bonds as a curing catalyst, the silanol groups present in the polysiloxane-type macromonomer, which is a monomer component, or silanol groups formed by the hydrolysis of the alkoxy groups in the above-mentioned monomers, and oxirane group present in the vinyl monomer, which is another monomer component, serve as crosslinking functional groups. With such a coating composition, the curing reaction proceeds both on the film surface and inside it even at a low temperature of no higher than 100°C, the difference in degree of curing between the surface and inner regions of the cured product is small, and shrinkage is prevented. Accordingly such a coating composition is preferred from the standpoint of the present invention.

The glass powder is introduced in the clear coating material to obtain a matte film. The particle size of the glass powder should be within a range from 5 to 50 μ, preferably, from 8 to 25 μ. If the particle size is less than 5 μ, the matting efficiency is low, and when the particle size is above 50 μm, smoothness of the coated surface and its resistance to contamination degrade which is undesirable. It is most preferred that the particles have a spherical shape, but they may also have other shapes. Hollow particles may also be used. If a glass powder consisting of hollow particles is used in a large amount, the transparency of the clear film can be easily degraded. Therefore, it is not recommended that such a coating material be applied to the surface of a film with a deep color. However, it can be readily coated on the surfaces with a light color. The glass powder can be manufactured by a well-known process. As for the composition, the appropriate glass powder consists of SiO_2, Al_2O_3, Na_2O, K_2O, MgO, and CaO. An especially significant matting effect is obtained with a glass powder having a particle size of 8-25 μ. Furthermore, the content of the glass powder is 30-120 wt. parts (preferably, 40-110 wt. parts) per 100 wt. parts of resin solids contained in the clear coating material. This content, however, is determined by the degree of matting. In order to obtain a 60-degree mirror finish surface reflectivity of 10-30%, the glass powder content should be 50-100 wt.%. Furthermore, the glass powder used in accordance with the present invention can be treated or can be employed without treatment. The treatment of glass powder can be conducted with aminosilanes, glycidyl silanes, acrylic silanes, or the like.

The clear coating material employed in accordance with the present invention contains the above-described resin composition and glass powder as the main components. It is preferred that they be dissolved or dispersed in an organic solvent and/or water to obtain a liquid coating material. The liquid coating material may be in the form of an organic solution, a high-solid composition, a nonaqueous dispersion, an aqueous solution, or an aqueous dispersion. The liquid coating material may be prepared by a well-known method. The powdered coating material may also be used.

If necessary, the clear coating material may additionally contain a coloring pigment, a metallic pigment, and the like.

The coloring coating material is coated on the substrate prior to the above-described clear coating material. It contains a resin composition which can be three-dimensionally cured at room temperature or by heating and a coloring pigment as the main components.

The resin composition may be one or no less than two compositions described above with reference to the clear coating material. One or no less than two pigments selected from the usual coloring pigments such as titanium white, carbon black, and phthalocyanine blue and metallic pigments can be used as the coloring pigment.

The coloring coating material used in accordance with the present invention is preferably obtained by dissolving or dispersing the resin composition and coloring pigment in an organic solvent and/or water. It may be in the form of an organic solution, a high-solid composition, a nonaqueous dispersion, an aqueous solution, or an aqueous dispersion, and may be prepared by a well-known method. The powdered coating material may also be used.

A method for matte finish coating in accordance with the present invention comprises surface treating, if necessary, a substrate (metallic and/or plastic automobile body), priming, applying a midcoating layer, and then coating the coloring coating material. No specific restriction is placed on the thickness of the coated film, but it is preferred that the cured film has a thickness of 10-30 μ. The colored coating film is crosslinked at a temperature within a range from normal temperature to 160°C and coated with the clear coating material. Alternatively the colored coating film is coated with the clear coating material in a non-cured state. The appropriate thickness of the clear film is within a range from 20 to 100 μ, as a cured film. The clear coating material is preferably cured at a temperature within a range from room temperature to 160°C upon coating. One or, if necessary, no less than two layers of the clear coating material may be coated.

The gloss value of the matte film formed by the method in accordance with the present invention can be easily adjusted for no more than 50%, as represented by a 60-degree mirror finish surface reflectivity. Moreover, the gloss value of the matte coating shows practically no changes in polishing with a wax or a polishing agent. In addition, the resistance of the matte film formed in accordance with the present invention to scratches, weather, and contamination is superior to those obtained with the conventional matting agents. Therefore such a film is excellent for automobile outer bodies.

The present invention will be described below in greater detail with reference to embodiments thereof. The terms "parts" and "%" stand for wt. parts and wt.%.

Embodiment 1

A dull-finished steel sheet treated with zinc phosphate was coated with an epoxy cationic electrophoretic layer to obtain a dry film thickness of 20 μ. The film was baked for 20 min at a temperature of 170°C. The coated surface was then polished with a #400 sandpaper and then degreased by rubbing with a gauze infiltrated with petroleum benzene. Then, an amino-containing alkyd paint for midcoating of automobiles was coated so as to obtain a dry film thickness of 30 μ, followed by baking for 30 min at a temperature of 140°C. The coated surface was polished with a #400 sandpaper with water, dried, and rubbed with petroleum benzene.

The midcoating surface was then coated with Magicron Silver Enamel (trade name, manufactured by Kansai Paint Co., alkyd resin – metallic paint of amino resin type) for a dry film thickness of 15 μ. The coating surface was coated, without curing, with the below-described

clear coating material for matting to obtain a cured film thickness of 35 μ. The coating was allowed to stay for 10 min at room temperature and then baked for 30 min at a temperature of 140°C to cure both films.

<Clear coating material for matting>

A total of 1852 parts of Magicron HK-2 clear coating material (trade name, manufactured by Kansai Paint Co., acrylic resin – amino resin type), 2500 parts of glass powder (spherical particles, particle size 10 μ), and 648 parts of xylene were dispersed for about 40 min in a sand mill to a size of no more than 10 μ as determined by a fineness gage, and a milled clear coating material was obtained. The content of the glass particles was 100 wt. parts per 100 wt. parts of resin solids.

Then, a total of 1000 parts of the milled clear coating material was stirred and mixed with 56 parts of Magicron HK-2 clear coating material, and the resulting mixture was diluted to a viscosity of 25 s (Ford cup, #4/20°C) with a mixed solvent containing a petroleum-derived solvent, xylol, butyl acetate, and n-butanol at a ratio of 30 : 20 : 30 : 20.

Embodiment 2

All the operations were conducted in the same manner as in Embodiment 1, except that the glass powder in the clear coating material used in Embodiment 1 had a particle size of 20 μ (spherical particles).

Embodiment 3

The steel sheet with the midcoating prepared in Embodiment 1 was coated with Neoamylac Ivory (trade name, manufactured by Kansai Paint Co., Ltd., ivory paint based on a polyester resin and an amino resin) for a dry film thickness of 35 μ. The coating was cured by baking for 30 min at a temperature of 140°C. Then, the coated surface was coated under the same conditions as in Embodiment 1 with a clear coating material of the same composition as that used in Embodiment 1, except that the glass powder consisted of hollow particles and the amount of the glass powder was decreased by half. The coating obtained was cured by baking for 30 min at a temperature of 140°C.

Comparative Example

A total of 1000 parts of Magicron HK-2 clear coating material and 54 parts of a silica powder (manufactured by Cabot Corp., trade name Silnex) were dispersed for 10 min in a dispersing apparatus. The mixture was diluted in the same manner as in Embodiment 1.

The operations were conducted in the same manner as in Embodiment 1, except that this clear coating material was used.

Results of Performance Test

The results of performance test of the matte films obtained in the above-described embodiments and comparative example are presented below.

		Embodiments			Comparative example
		1	2	3	1
Glass powder	Hollow or not	Not	Not	Hollow	Silica powder
	Particle size (μm)	10	20	10	1.5
	Content	100	100	50	1.5
60-degree gloss value (%)		25	10	30	10
Finish appearance		Good	Good	Good	Nonuniform matte
Resistance to contamination		O	O	O	X
Resistance to scratches		O	O	O	X
Weather resistance		O	O	O	X

Content : content per 100 wt. parts of resin solids in a clear coating material.

Finish appearance : visual evaluation.

Resistance to contamination: a total of 1 g of contamination dust No. 15 complying with JIS was placed on a painted sheet (5 x 5 cm) and uniformly spread by 200 sweeping motions of a brush. The dust was allowed to stay on the sheet for 24 h at a temperature of 20°C. Then, the dust was cleaned in a water flow with a clean brush, and the degree of contamination was examined.

⊙ : absolutely no contamination is observed.
O : slight contamination is observed.
Δ : some contamination is observed.
X : significant contamination is observed.

Resistance to scratches : a dyed substance friction strength test (the tester was manufactured by Daido (illegible) Kagaku Seiki Seisakusho K. K.). An abrasive powder ((illegible) cleanser) was kneaded with water and placed on the coated surface. Then a tester terminal was placed on top of it, a load of 0.5 kg was applied, and 25 reciprocal friction cycles were conducted. After washing with water, the degree of scratches was evaluated by five levels: ⊙, O, ◎, Δ, and X.

Weather resistance : A QUV accelerated exposure test was conducted by using an accelerated weather resistance tester manufactured by a Q-Panel Co. The coating film was evaluated after a 3000-h cyclic test (125 cycles), each cycle consisting of (test conditions):

UV irradiation for 16 h at 60°C.

Water setting for 8 h at 50°C.

⊙ ... gloss is maintained which is practically identical to the initial gloss.
O ... gloss is slightly decreased, but no defects, such as cracking or whitening, are observed.
X ... significant decrease in gloss, hairline cracks and whitening (choking) effect are observed, standard requirements are not met.

Assignee: (140) Kansai Paint Co., Ltd.

TRANSLATOR'S NOTE: Due to poor copy legibility, the numbers in this patent (54-1335) are not verified.

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⑬公開　平成3年(1991)12月27日

審査請求　未請求　請求項の数 1　(全4頁)

⑭発明の名称　自動車外板つや消し塗装仕上げ法

⑳特　願　平2-100862
㉒出　願　平2(1990)4月17日

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明細書

1．発明の名称

自動車外板つや消し塗装仕上げ法

2．特許請求の範囲

架橋硬化型着色塗料を塗装し、該塗面に架橋硬化型クリヤー塗料を塗装する自動車外板塗装工程において、該クリヤー塗料として、粒径5～50μのガラス粉末を樹脂固形分100重量部あたり30～120重量部配合してなる塗料を用いることを特徴とする自動車外板つや消し塗装仕上げ法。

3．発明の詳細な説明

＜産業上の利用分野＞

本発明は自動車外板のつや消し塗装仕上げ方法に関し、さらに詳しくは、ポリッシュしてもつや消し効果が変らず、しかも耐スリキズ性、汚染性および耐候性などがすぐれた塗膜に仕上げる方法に関する。

＜従来の技術とその課題＞

自動車外板（二輪車、バス、トラックなども含む）は一般に光沢のすぐれたつやあり塗膜に仕上げられているが、近年、新意匠としてつや消し塗膜に仕上げることがある。

つや消し塗膜に仕上げるために、従来、上塗り塗料にシリカ粉末を配合することが多く行なわれていたが、該シリカ粉末は塗膜表層部に浮くため、該塗面をポリッシュするとシリカ粉末が離脱してその部分だけつやありとなって好ましくない。さらに、耐スリキズ性、耐汚染性や耐候性なども低下するという欠陥も有している。

＜課題を解決するための手段＞

本発明の目的は上記した欠陥をすべて解消することであり、その結果、特定粒径のガラス粉末を配合したクリヤー塗料を用いることによってその目的が達成でき、本発明を完成した。

すなわち、本発明は、架橋硬化型着色塗料を塗装し、該塗面に架橋硬化型クリヤー塗料を塗装する自動車外板塗装工程において、該クリヤー塗料として、粒径5～50μのガラス粉末を樹脂固形分100重量部あたり30～120重量部配合し

てなる塗料を用いることを特徴とする自動車外板つや消し塗装仕上げ法に関する。

本発明における「つや消し」とは、該塗面の光沢値がＪＩＳ　Ｋ５４００、６．７に基づく６０度鏡面反射率が５０％以下、特に３０％以下である塗面を言う。本発明では、上記クリヤー塗料の塗面がかかる光沢値を有しており、つや消し塗膜を形成する。

本発明で用いるクリヤー塗料は、室温もしくは加熱によって三次元に架橋反応して架橋硬化する樹脂組成物および上記ガラス粉末を必須成分とするつや消し透明塗膜形成用塗料である。

上記樹脂組成物は原則として基体樹脂および架橋剤を主成分としている。基体樹脂としては架橋性官能基を有するアクリル樹脂、ポリエステル樹脂およびアルキド樹脂などがあげられ、架橋剤としてはメチロール化および（又は）アルキルエーテル化メラミン樹脂や尿素樹脂、さらにポリイソシアネート化合物（ブロック化物も含む）も使用できる。また、架橋剤を用いない自己硬化性樹脂も上記樹脂組成物として使用できる。

さらに、水酸基、アルコキシル基等の速鎖の官能基を２個以上有する特定のポリシロキサン系マクロモノマーとオキシラン基含有ビニルモノマーとを単量体成分として含有するビニル共重合体、又は上記特定のポリシロキサン系マクロモノマーを必須単量体成分とする重合体とオキシラン基含有ビニル単量体を必須単量体成分とする重合体との混合物を基体樹脂とし、これに、硬化触媒として、ルイス酸、プロトン酸、金属アルコキシド、有機金属化合物及びＳｉ－Ｏ－Ａℓ結合を有する化合物から選ばれた少くとも一種を配合した塗料組成物は、単量体成分であるポリシロキサン系マクロモノマー中に存在するシラノール基や該マクロモノマー中のアルコキシル基の加水分解によって生じるシラノール基と、他の単量体成分であるオキシラン基含有ビニルモノマー中のオキシラン基とが架橋官能基となり、１００℃以下の低温においても、塗膜の表面と内部で同時に硬化反応が進行し、しかも硬化物の表面と内部とで硬化の程度の差が少なく、チヂミを生じ難いものであり、本発明において好適に用いられる。

ガラス粉末はクリヤー塗料に配合し、該塗膜をつや消しにするためのものであって、その粒径が５～５０μ、好ましくは８～２５μのものを用いる必要があり、５μより小さくなるとつや消し効果が低下し、また５０μより大きくなると塗面の平滑性や耐汚染性などが低下するので、いずれも好ましくない。形は球状が最も好ましいが、それ以外であってもさしつかえなく、中空状も用いられる。中空状ガラス粉末を多量配合するとクリヤー塗膜の透明性が低下しやすいので、このものは濃色の着色塗膜面に適用することはあまり好ましくないが、淡色の塗面には問題なく塗装できる。ガラス粉末はそれ自体既知の方法で製造することができ、組成的にはSiO_2、Al_2O_3、Na_2O、K_2O、MgO およびCaO からなるガラス粉末が適している。粒径８～２５μのガラス粉末を用いるとつや消し効果が特に顕著であった。また、ガラス粉末の配合量はクリヤー塗料中の樹脂固形分１００重量部あたり、３０～１２０重量部（好ましくは４０～１１０重量部）であるが、この配合量はつや消し程度によって決まる。６０度鏡面反射率で１０～３０％では、ガラス粉末の配合量は５０～１００重量部になる。また本発明に配合するガラス粉末は未処理のものと処理したものが使用できる。ガラス粉末の処理はアミノ・シラン、グリシド・シラン、アクリル・シランなどがある。

本発明で用いるクリヤー塗料は上記の樹脂組成物およびガラス粉末を主成分としており、これらを有機溶剤および（又は）水中に溶解又は分散して液状とすることが好ましく、その形態は有機溶液型、ハイソリッド型、非水分散液型、水溶液型および水分散型などがあげられ、それ自体既知の方法で調製できる。粉体型塗料であってもよい。

該クリヤー塗料には、必要に応じて、着色顔料、メタリック顔料などを配合できる。

着色塗料は上記クリヤー塗料に先立って被塗面に塗装する塗料であって、室温もしくは加熱によって三次元に架橋反応して架橋硬化する樹脂組成

物および着色顔料を主成分としている。

該樹脂組成物は前記クリヤー塗料で例示したものから選ばれる1種もしくは2種以上が用いられる。着色顔料は、チタン白、カーボンブラックおよびフタロシアニンブルーなどの通常の着色顔料およびメタリック顔料などから選ばれた1種又は2種以上が使用できる。

本発明で用いる着色塗料は上記樹脂組成物および着色顔料を有機溶剤および／又は水に溶解もしくは分散せしめることによって得られるものが好適である。その形態は有機溶液型、ハイソリッド型、非水分散液型、水溶液型および水分散型などがあげられ、それ自体既知の方法で調製できる。粉体型塗料であってもよい。

本発明のつや消し塗装仕上げ方法は、被塗物（金属および／又はプラスチック製自動車外板）を必要に応じて表面処理、プライマー塗装および中塗り塗装を行なった後、上記着色塗料を塗装する。塗装膜厚は制限されないが硬化塗膜に基づいて10～30μが好ましい。該着色塗膜を常温～160℃において架橋硬化したのち又は未硬化の状態で、該塗膜面に上記クリヤー塗料を塗装する。クリヤー塗膜の膜厚は硬化塗膜に基づいて20～100μの範囲が適している。クリヤー塗料を塗装後、室温～160℃で硬化させることが好ましい。クリヤー塗膜は単一層でよいが、必要に応じて2層以上であってもよい。

本発明の方法によって形成されるつや消し塗膜は、光沢値が60度鏡面反射率で50％以下に容易に調整でき、しかも、ワックスや研磨剤などでポリッシュしてもつや消し塗面の光沢値は殆ど変化せず、かつ、耐スリキズ性、耐候性および耐汚染性なども従来のツヤ消剤を用いたものに比べて著しくすぐれており、自動車外板用ツヤ消塗膜として好適である。

以下、本発明を実施例によって更に具体的に説明する。なお、部及び％は重量部及び重量％を示す。

実施例1

リン酸亜鉛処理ダル鋼板にエポキシ系カチオン電着塗料を電着塗装法で、乾燥膜厚20μとなるように塗装し、170℃－20分焼付けた。ついで＃400サンドペーパーで塗面を研磨後石油ベンジンをしめたガーゼで塗面を拭き脱脂する。その後アミノ・アルキド系自動車中塗り塗料を乾燥膜厚30μとなるように塗装し、140℃－30分焼付けた。ついで＃400サンドペーパーで塗面を水研し、水切り乾燥し、石油ベンジンで塗面を拭いた。

次いで、この中塗り塗面にマジクロンシルバーエナメル（関西ペイント（株）製、商品名、アルキド樹脂／アミノ樹脂系メタリック塗料）を乾燥塗膜に基づいて15μになるように塗装した。該塗膜を硬化させることなく、該塗面に下記つや消し用クリヤー塗料を硬化塗膜に基づいて35μになるように塗装し、室温で10分間放置後、140℃で30分焼付けて両塗膜を硬化せしめた。

＜つや消し用クリヤー塗料＞

マジクロンHK－2クリヤー（関西ペイント（株）製、商品名、アクリル樹脂／アミノ樹脂系）1852部、ガラス粉末（球形、粒径10μ）2500部およびキシレン648部をサンドミルでツブゲージで10μ以下になるまで約40分間分散してミルベースクリヤーを得た。ガラス粉末配合量は樹脂固形分100重量部あたり100重量部である。

次いで、このミルベースクリヤー1000部とマジクロンHK－2クリヤー56部とをディスパー撹拌し、混合してから石油系溶剤／キシロール／酢酸ブチル／n－ブタノール／30／20／30／20の混合溶剤で粘度25秒（フォードカップ＃4／20℃）に希釈した。

実施例2

実施例1のクリヤー塗料におけるガラス粉末を粒径20μ（球形）のものに変更した以外はすべて実施例1と同様に行なった。

実施例3

実施例1で調製した中塗り塗装鋼板にネオアミラックアイボリー（関西ペイント（株）製、商品名、ポリエステル樹脂／アミノ樹脂系アイボリー色塗料）を乾燥塗膜が35μになるように塗装し、140℃で30分焼付けて硬化してから、該塗面に、実施例1で用いたクリヤー塗料におけるガラス粉末を中空状で、かつ1／2量に変更した以外は該クリヤー塗料と同じ組成および条件で塗装し、140℃で30分焼付けて硬化せしめた。

比較例

マジクロンHK－2クリヤー1000部とシリカ粉末（キャボット社製、商品名"シルネックス"）54部とをディスパーで10分間分散し、実施例1と同様に希釈した。

このクリヤー塗料を用いた以外は実施例1と同様に行なった。

性能試験結果

上記実施例および比較例で得たつや消し塗膜についての性能試験結果は次のとおりであった。

		実施例			比較例
		1	2	3	1
ガラス粉末	中空の有無	無	無	有	粉末シリカ
	粒径（μ）	10	20	10	1.5
	配合量	100	100	50	1.5
60度光沢（%）		25	10	30	10
仕上がり外観		良好	良好	良好	ブムラ発生
耐汚染性		○	○	○	×
スリキズ性		○	○	○	×
耐候性		○	○	○	×

配合量：クリヤー塗料中の樹脂固形分100重量部あたりの配合量。

仕上がり外観：目視判定。

耐汚染性：5×5cmの塗板上に、JIS第15種汚染ダスト1gをのせて、これを刷毛で20回掃くように均一に拡げ、20℃で24時間静置した。次に、これを清浄な刷毛を用いて流水中で洗浄し、汚染の程度を調べた。

○･･･ 全く汚れが認められない。

○･･･ 僅かに汚れが認められる。

△･･･ かなり汚れが認められる。

×･･･ 著しく汚れが認められる。

耐スリキズ性：染色物摩擦堅牢度試験（大栄化学精器製作所製）を用いた。磨き粉（ダルマ・クレンザー）を水で固練りして塗面に置き、その上を試験機端子で押えて、0.5Kg荷重をかけ、25往復摩擦する。水洗後、スリキズの程度を、○．○．◎．△．×の5段階で判定した。

耐候性：Qパネル社製促進耐候性試験機を用いたQUV促進パクロ試験による。

試験条件：紫外線照射　16H／60℃

水凝結　8H／50℃

を1サイクルとして3000時間（125サイクル）試験した後の塗膜を評価した。

○･･･ 殆んど初期とかわらない光沢を保っている。

○･･･ 僅かに光沢低下があるが、ワレや白化等の欠陥がない。

×･･･ 著しい光沢低下、ヒビワレ、白化（チョーキング）現象が認められ、不合格である。

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